



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2003GU18B

Title: Inventory and Evaluation of Karst Features Relating to Past and Present Groundwater Flow on Rota, Commonwealth of the Northern Mariana Islands (CNMI), in Terms of the Carbonate Island Karst Model

Project Type: Research

Focus Categories: Groundwater, Hydrology, Climatological Processes

Keywords: Groundwater, Island Karst, Carbonate Island Aquifers

Start Date: 03/01/2003

End Date: 02/29/2004

Federal Funds Requested: \$35933.00

Matching Funds: \$0.00

Congressional District: N/A

Principal Investigators: Jenson, John

Abstract: The island of Rota in the Commonwealth of the Northern Mariana Islands relies on groundwater derived from the uplifted limestone aquifer that covers most of the island's surface. Although the island has a nascent tourist industry and has seen important development in recent years, including a large golf resort, there has yet to be a systematic study of the karst geology to support the development of the island's groundwater resources. The proposed project would provide a survey of the karst features that control input, transport, and discharge of fresh water from the aquifer. Groundwater developers and managers on Rota will benefit directly from improved specific knowledge of aquifer properties and groundwater transport and storage. Specific work proposed includes mapping and cataloging karst surface features, caves, and coastal discharge features. Such work provides the foundation for detailed hydrogeologic studies and engineering evaluations to support appropriate development of Rota's island karst aquifer. In addition to obtaining specific data on Rota's aquifer, the proposed project will contribute to ongoing efforts to develop a more accurate and complete conceptual model of carbonate island karst aquifers in general. It is well understood that standard hydrologic models for diffuse flow through particulate media are inadequate for karst aquifers. Even models that have been

developed for temperate continental karst aquifers, however, cannot accommodate the unique geologic complexity and hydrologic properties of carbonate aquifers comprised of the young limestone units in tropical islands and coastal plains. Karst research begun on the relatively uncomplicated aquifers of Atlantic-Caribbean islands has recently been extended to Guam (Taborosi, 2000; Mylroie et al., 2001), Saipan, and Tinian (Stafford et al., in press). The proposed project will extend such work to Rota as well. Rota is unique in that most of the island's potable water comes from permanently flowing karst springs that appear to be fed by water shunted down the flank of its volcanic core through conduits along the contact with the limestone bedrock. Reconnaissance work in the summer of 2002 suggests that the caves from which the spring water emerges may have formed along an ancient shoreline at a previous relative sea level. These attributes make the island's aquifer ideal for testing certain hypotheses regarding the structure and properties of island karst aquifers. A more solid understanding of them will also, of course, provide a reliable basis for successful aquifer protection and development on Rota. The proposed work will support an M.S. thesis in environmental science at the University of Guam. Results will be presented in professional journals, international conferences, and website publications, and will be made accessible to local water resource professionals and educators through technical reports, local conferences, outreach publications, and personal interaction between WERI researchers and professional water resource managers in the CNMI.

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